

RFID Based Rotary Car Parking System

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I. INTRODUCTION

Today the world is developing and developing. From the past, people are inventing new things for higher living standards. People get the benefits of invention. It gives the positive and negative effects to the world. Positive effects take the human kinds to higher living standards. But the other side, the planet is suffering the effect of invention.

saturated with commercial office buildings but not as many parking spaces. Drivers generally need to spend a significant amount of time circling the blocks around their destination searching and waiting for available parking spaces. To overcome above problem there is need of an advanced car parking system.

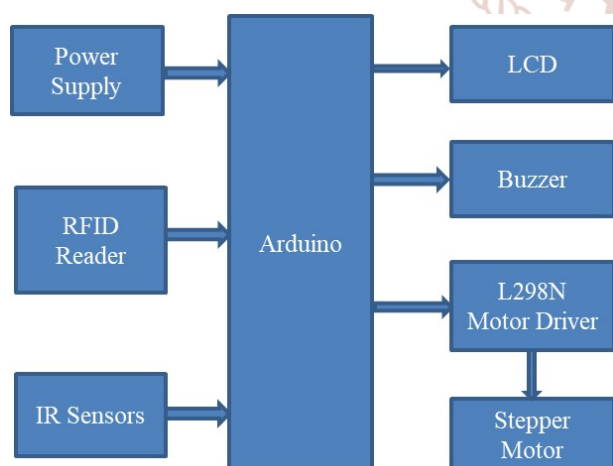


Figure 1 Block Diagram of Rotary Car Parking System

As the city modernization progresses, the number of vehicles increases accordingly, instead of taking public transportation, people travel in personal vehicles to different locations in the cities for convenience and comfort. Due to the lack of a well-planned policy for parking facilities, the demand of parking spaces is generally much greater than the supply. Additionally, downtown areas are gradually

ABSTRACT

This paper deals with the manufacturing of a Prototype of Rotary Car Parking System using Sensors. Lack of space availability has always been a problem in urban areas and major cities and to add to it there are cars parked callously on the streets that further limit the space. In order to handle the issue of parking in busy places various types of vehicle parking systems are used worldwide Rotary Automated Car Parking System and many more. This thesis work is aimed to develop a scale down working model of a car parking system which will reduce the excess use of land space. This total prototype is powered by unipolar stepper motor. This model also uses a RFID Tag and Reader. When the car comes on the ramp the switch will be activated and the pallet comes to carry the vehicle. When the switch will be operated by the operator, sprockets starts to rotate and the new space will be adjusted for new vehicle. Planners, developers, architects are finding out solutions to tackle this problem of parking, so took this opportunity to bring this technology of an automated parking system which will reduce a lot of land space for parking purpose. By testing and analyzing the working model definitely get the view to develop the parking lots at difficult and busy commercial places.

KEYWORDS: RFID, LCD, Arduino AT-mega, IR Sensor

This paper can be used in hotel, hostel, high buildings, supermarkets and condos etc. Figure 1 shows the block diagram of rotary car parking system.

II. IMPLEMENTATION OF ROTARY CAR PARKING SYSTEM

The following components are used for implementing the rotary car parking system.

- Arduino Mega
- RFID
- IR Sensor
- Stepper Motor
- Servo Motor
- LCD Display

A. Arduino Mega

All of it that were renowned for premier board, the Arduino Uno. The Arduino Mega 2560, while slightly less well known, is the Uno's bigger. The Arduino Mega 2560 is a beefy microcontroller board based around the powerful ATmega2560 microprocessor with all the capabilities of four Uno boards combined, and is capable of almost anything at it.

As stated before, the brain behind the Arduino Mega is the ATmega2560. Thanks to the ATmega2560 that is associated crystal oscillator, the Arduino Mega sports 16 MHz clocking speed, as well as 256 KB of flash, 8 KB of SRAM and 4 KB of EEPROM. Because of its brawnier processor, the Mega has 54 digital I/O pins (15 of which can provide PWM output) and 16 analog pins, which is almost four times that of its Uno[1].

B. RFID Technology

RFID (Radio-frequency identification), uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically-stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source (such as a battery) and may operate hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture (AIDC). RFID tags are used in many industries, for example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line; RFID-tagged pharmaceuticals can be tracked through warehouses; and implanting RFID microchips in livestock and pets allows for positive identification of animals [3].

C. IR Sensors

In this system, three IR sensors are used for checking car entry and exit. Two IR (IN and OUT) sensors are used where the car exists in parking area or not. Another one sensor (IR) is used to sense the car is outing from the parking area and it is controlled to servo gate. The car is detected by IR sensor the servo gate opens and not detected the servo gate closes.

D. Stepper Motor and L298N Motor Driver

Stepper motor is used only for rotating the parking stairs. If the owner requests some number, it rounds up to reach that number in front of him and then it stops. It can't drive itself directly from the output of arduino without using any driver. There are many drivers to drive it but L298N driver is used in this thesis. 12 V supply is used mostly as an external supply to one pin of L298N although it can give external supply from 6 V to 35 V.

E. Servo Motor

Servo motor is used as a gate at the entry of car parking area. It is mostly as a gate in many projects because of rotating only 180 degrees. In this thesis, it is used for two aims. One aim is for IR sensor is detecting the car and another one is if RFID card reader correct code, the servo gate opens.

F. LCD Display

20x4 LCD display is used for showing the information of inputs and outputs situations. The first line shows the request and position, the second line shows free space in car parking area, the third line describes card number that the owner shows and the forth line displays the showing card is valid or invalid.

III. SYSTEM DESIGN

In Figure 2, Arduino is used for managing the processes of inputs and outputs. RFID card reader is placed at the entry of the car parking area which is used for checking the showing card is correct or incorrect. After correct showing card, the screen displays "THE CARD IS VALID" and then the servo

gate opens and the owner is allowed to enter the car parking area. If not "THE CARD IS INVALID", servo gate still closes and the owner is not from this building. And then, 20x4 LCD display is used for showing the information of inputs and outputs situations. The first line shows the request and position, the second line shows free space in car parking area, the third line describes card number that the owner shows and the fourth line displays the showing card is valid or invalid. Stepper motor is used only for rotating the parking stairs.

If the owner requests some number, it rotates to reach that number in front then it stops. L298N is used for driving and giving high current stepper motor. Then, six IR sensors are used for counting up from one to six are used the position of car stairs that is pasted on the floor of every parking. Two IR (IN and OUT) sensors are used where the car exists in parking area or not. Another one sensor (IR) is used to sense the car is outing from the parking area and it is controlled to servo gate. IR sensor IN the servo gate opens and not detected the servo gate closes. Keypad is used to call the desire car parking from any stairs to the entry that can be pressed '1' to '6' then the parking that the owner wants go to the entry gate. Finally, push button is used to open the servo gate.

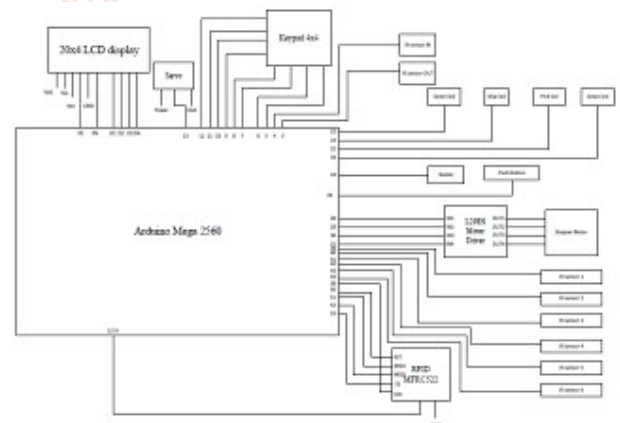


Figure 2 Circuit Diagram of Rotary Car Parking System

IV. TEST AND RESULTS

A. Simulation Result

In this software interface, all of the process is doing in automatic system by using arduino software in C++ programming language. If the car parking system is start running, the owner gives the request with RFID card. When one card receives, the stepper motor runs and red led on and green LED off. Checking always that the request and IR sensor is equal or not. If still "No", the IR sensor counts up one when the parking crosses through it.

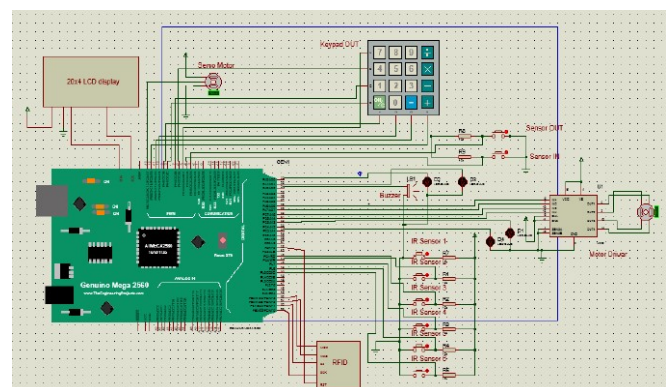


Figure 3 Simulation Circuit of Rotary Car Parking System

When the reading IR sensor and the RFID request are equal, LED green is on and red is off. After the stepper motor is stopped, another IR sensor IN check car in or not. At the same time, IR sensor OUT also detects the car out or not. If IR sensor IN is 1, car enter into the parking and if IR sensor OUT is 1, car leaves from the parking and finally reaches end process and loop always from the start. Figure 3 shows the simulation circuit of rotary car parking system.

B. Experimental Results

The prototype for rotary car parking system is constructed as shown in Figure 4. RFID reader reads the valid RFID card, the stepper motor is for turning with step the fiber plate to reach the desired position. Stepper motor has 4 wires connect with L298N motor driver that is a junction for stepper motor and Arduino. If the invalid card is read, the buzzer is ringing for one second and the gate will be closed.

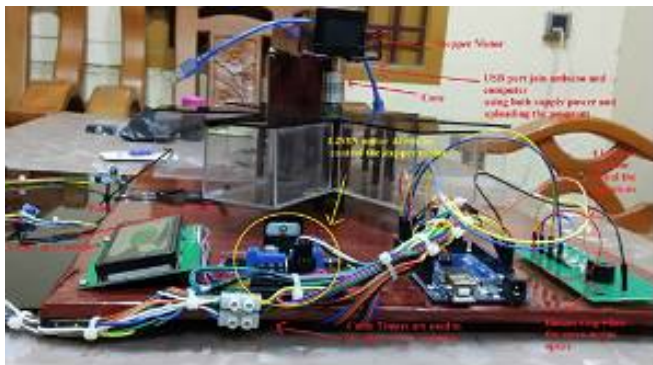


Figure 4 Prototypes for Rotary Car Parking System

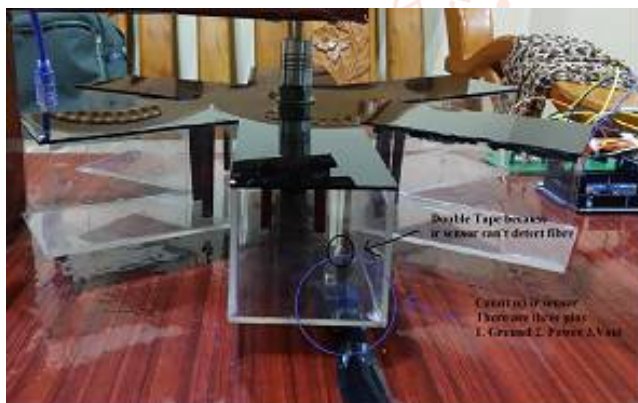


Figure 5 Count up IR Sensor

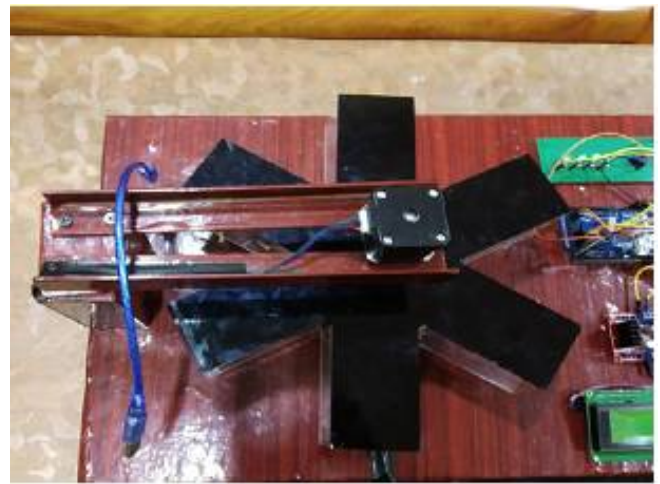


Figure 6 Top View of the Rotary Car Parking System

V. CONCLUSION

The proposed rotary car parking system is efficient and less time consuming as it uses an automation system the nearest parking slot and also helps in tracking the number of cars entered in the parking area which reduces human efforts. The system provides high performance in tracking the car entering and exiting from the parking area and also showing its presence in a parking slot. By using this system, it doesn't have to have any security and not need to have wide space. The earlier system used only with button but now automatic system with RFID card interfacing of the hardware circuit with the computer. The circuit can be used at all places starting from domestic to the industrial sectors. Therefore, this thesis is compatible for any places such as supermarkets, hotels, buildings and hospitals etc.

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